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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 09/592,950 | 06/13/2000 | Xuesong Chen | 9351-20/HSF | 7043 |

1059 7590 08/12/2003

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| EXAMINER |
|---|
| ALEJANDRO, RAYMOND |

| ART UNIT | PAPER NUMBER |
|---|---|
| 1745 | 14 |

DATE MAILED: 08/12/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

A 8-14

| Office Action Summary | Application N . | Applicant(s) | |
|---|---|---|---|
| | 09/592,950 | CHEN ET AL. | |
| | Examiner | Art Unit | |
| | Raymond Alejandro | 1745 | |

*-- The MAILING DATE of this c mmunication appears on the c ver sheet with the corresp ndence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *07 August 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-6,9,10 and 13-20* is/are pending in the application.

4a) Of the above claim(s) *1-3 and 13-16* is/are withdrawn from consideration.

5)☒ Claim(s) *17-20* is/are allowed.

6)☐ Claim(s) *4-6,9 and 10* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *07 August 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *13* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

## DETAILED ACTION

### *Continued Examination Under 37 CFR 1.114*

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 08/07/03 has been entered.

This communication is responsive to the amendment filed on 08/07/03. The applicants have overcome the objections to certain claims. However, the claims are newly rejected over the same art as seen below.

### *Election/Restrictions*

1. This application contains claims 1-3 and 13-16 drawn to an invention nonelected with traverse in Paper No. 4. A complete reply to this rejection must include cancelation of nonelected claims or other appropriate action.

### *Drawings*

2. New corrected drawings including replacement sheets are acceptable.

### *Claim Rejections - 35 USC § 103*

3. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

4. Claims 4-6 and 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Condit et al 6416891.

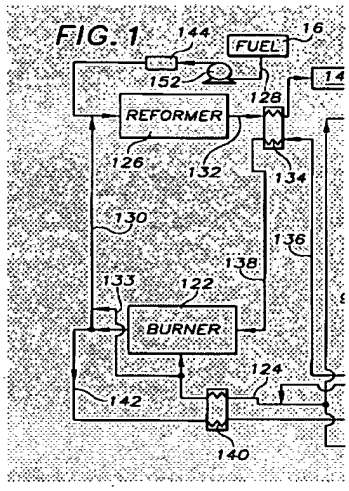
The instant application is directed to a fuel cell system wherein the claimed inventive concept comprises the specific catalytic reactor arrangement. Other limitations include the fuel cell stack, the particular reactor configuration and connections.

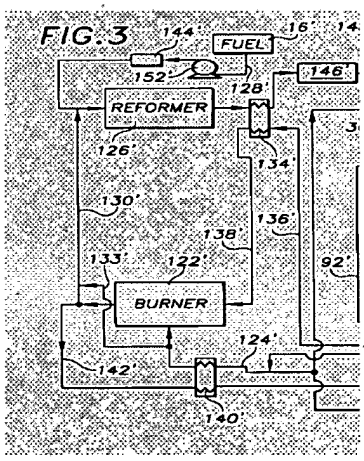
With respect to claim 4, 9-10:

Condit et al disclose an operating system for a fuel cell power plant (abstract) wherein the fuel cell comprises a plurality of fuel cells typically arranged in a stack surrounded by an electrically insulating frame structure that defines manifolds for directing flow reducing, oxidant, coolant and product fluids; each individual cell generally includes an anode electrode and a cathode electrode separated by an electrolyte (col 1, lines 19-24); wherein a reactant or reducing fluid such as hydrogen is supplied to the anode electrode, and an oxidant such as oxygen or air is supplied to the cathode electrode. In a cell utilizing a proton exchange membrane (PEM) as the electrolyte, the hydrogen electrochemically reacts at a surface of the anode electrode to produce hydrogen ions and electrons (col 1, lines 25-30). It is further disclosed that a solid polymer electrolyte is well-known in the art (col 1, l9ines 39-41). It is further disclosed that fuel cells utilizing PEM electrolytes typically involves securing an appropriate first catalyst layer between a first surface of the PEM and a first or anode porous substrate layer to form an anode electrode adjacent the first surface of the PEM, and securing a second catalyst layer between a second surface of the PEM opposed to the first surface and a second or cathode porous substrate layer to form a cathode electrode on the opposed second surface of the PEM; the anode catalyst, PEM,

and cathode catalyst secured in such a manner are well-known in the art, and are frequently referred as to a membrane electrode assembly (col 1, lines 54-65).

**Figures 1 and 3 below shows that the burner 122 per se supplies an exhaust stream 130 to the reformer 132 which further process the fuel to be fed into the fuel cell.**




It is also disclosed that the operating system includes fuel processing component means for processing hydrocarbon fuels into reducing fluids appropriate for providing fuel to an anode electrode of the fuel cell (col 12, line 65 to col 13, line 1). *The fuel processing component means may include a burner that may be a conventional or preferably a catalytic burner that oxidizes any excess reducing fluid such as hydrogen fed to the burner as an anode exhaust stream*

*through the anode exhaust passage after passing through the anode flow field; and a first reformer feed branch of the split oxidant passage secured in fluid communication with the inlet branch of the split oxidant passage and with the burner that directs a portion of the process oxidant stream into the burner; a reformer that receives a combusted burner exhaust stream from the burner in the reformer feed line between the burner and the reformer; and a reformed fuel discharge line that directs reformed fuel from the reformer into the reducing fluid inlet* (col 13, lines 3-22). Therefore, the combusted burner exhaust stream within the reformer feed line may be supplemented by, or replaced by a portion of the process oxidant stream directed to the reformer feed line (col 13, lines 25-30).

As for claim 5:

The fuel cell comprises a plurality of fuel cells typically arranged in a stack surrounded by an electrically insulating frame structure that defines manifolds for directing flow reducing, oxidant, coolant and product fluids (col 1, lines 18-22).

With respect to claims 6:

It is disclosed that the catalytic combustor receives the particular reactant streams through conduits (col 5, lines 35-40 and col 6, lines 9-12).

Condit et al disclose a fuel cell operating system according to the foregoing. However, Micheli et al does not specifically disclose the particular catalytic reactor and its tubular shape.

In view of the above, it would have been obvious to one skilled in the art at the time the invention was made to use the particular catalytic reactor as Condit et al disclose that the fuel processing component mean includes a burner that may be preferably a catalytic burner that oxidizes any excess reducing fluid. Thus, those of ordinary skill in art would understand that

catalytic reactors can be employed because they facilitate oxidation reaction of fuel and generate water, and operate at suitable low temperatures ranges. Accordingly, this fuel cell system may provide a thermodynamically optimized system for electrical power production due to the specific power generating elements configuration. Further, the cycle efficiency can be enhanced by adding all of the heat energy obtained from unreacted and reacted stream effluents to/from the fuel cell anode and cathode and/or supply source. Moreover, this arrangement thus provide the heat and humidity required for proper operation of the fuel cell system.

As to the specific reactor shape, it would have been obvious to one skilled in the art at the time the invention was made to recognize that Condit et al inherently disclose tubular combustors, as Condit et al's catalytic combustors are in fluid communication with conduits for receiving and exhausting streams, and hence, since those conduits are either pipes or tube through which the fluid is conveyed, it would be obvious to make the combustor having a similar configuration so as to enhance fluid transmission or distribution throughout the entire fuel cell system.

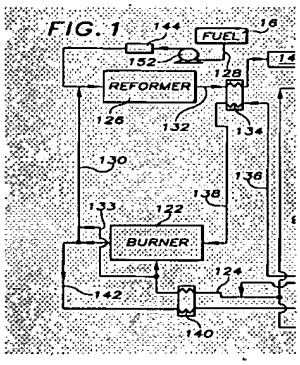
***Allowable Subject Matter***

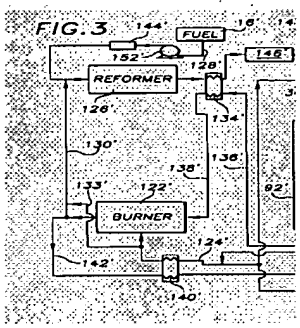
5. The following is a statement of reasons for the indication of allowable subject matter: for claims 17-20 was set forth in a prior office, refer to paper # 9.

6. Claims 17-20 are allowed.

***Response to Arguments***

**7.** Applicant's arguments filed 08/07/03 have been fully considered but they are not persuasive. The main contention of applicants' arguments is premised on the assertion that the prior art of record fails to reveal "supplying a catalytic reactor with a stoichiometric excess of fuel such that the outlet delivers heated and humidified fuel", that is to say, "supplying the heated and humidified fuel to the fuel inlet of the fuel cell". However, this assertion is not sufficient to overcome the rejection. In this respect, it is noted that the prior art teaches, above all and for the most part, the following: *Figures 1 and 3 below shows that the burner 122 per se supplies an exhaust stream 130 to the reformer 132 which further process the fuel to be fed into the fuel cell.*




Accordingly, applicants contends that "any used hydrogen in the anode exhaust stream is oxidized to produce water in the burner 122 and thereby heat the anode exhaust stream leaving the burner 122 as combusted burner exhaust stream and to render the burner exhaust stream

leaving the burner 122 nonflammable" as well as "complete combustion of the fuel to render the burner exhaust stream exiting the burner 122 through the outlet non-flammable". Nonetheless, the examiner asserts that even though the burner exhaust stream leaving the burner 122 might be combusted to be nonflammable, somehow, *certain degree of combustion incompleteness* may occur in the burner so as to leave any unused or un-combusted fuel in the burner exhaust which is then supplied to the reformer and thereafter to the fuel cell as reformed fuel. In that, it is pointed out that under normal operating conditions it is very unlikely that a full-complete (100 %) combustion takes place in the burner so as to totally and entirely burn or combust all the fuel therein without leaving any un-combusted amount fuel. It is further noted that certain degree of combustion incompleteness is broadly understood by the examiner as any combustion process in which the act or instance of burning the fuel is not 100 %. Unless substantial evidence be provided demonstrating that the combustion chemical reaction of the prior art proceeds as argued and expected by the applicant i.e. *100 % complete combustion* (*all* unused hydrogen in the anode exhaust stream is oxidized), the instant claims will remain rejected.

As to the assertion that the prior art does not teach supplying the heated and humidified fuel to the fuel inlet of the fuel cell, the examiner simply asserts that as illustrated in Figures 1 and 3 above the burner 122 per se supplies an exhaust stream 130 to the reformer 132 which further process the fuel to be fed into the fuel cell. Moreover, the claim language is silent as to the specific structural orientation and/or arrangement of the catalytic reactor with respect to the fuel cell, that is, the present claims fail to further indicate whether the catalytic reactor is either immediately downstream, immediately upstream, mid-point (halfway) downstream or mid-point (halfway) upstream or the like, with respect to the fuel cell and the fuel inlet locations.

In response to applicant's argument that "*In essence, the burner 122 is employed to replace the steam generating boiler, which is ultimately enhances the efficiency of the power plant 10*", the fact that applicant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985).

***Conclusion***

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Raymond Alejandro whose telephone number is (703) 306-3326. The examiner can normally be reached on Monday-Thursday (8:30 am - 7:00 pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Pat Ryan can be reached on (703) 308-2383. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Raymond Alejandro
Examiner
Art Unit 1745